Guideline by Battery Association of Japan
SBA G 1101-1997

SBA

Guideline for safety evaluation on secondary lithium cells

Amended on January 22, 1997

Battery Association of Japan

4,3 Comment

4.3.(1) Electrical Test

1. External Short Circuit :

When the terminals + – are externally short-circuited (in a state where the terminals + – are connected with an electric wire, or metal having extremely small resistance), an estimated risk is to generate heat abruptly and to rise in temperature because the cell discharges with large current. Accordingly, there is a possibility of burst or firing of the cell when the rise in temperature is large.

This test is assumed a case where the cell is erroneously short-circuited externally when handling or using the cell. The reason why 60 °C is set as a test temperature is to confirm that the cell is safe even if the cell is short-circuited and generates heat, and this is to conform the condition (**UL1642**) of a short circuit test in UL. Further, the resistance of 50 mΩ for the wire for external short-circuit was adopted the value in the Japanese proposal **IEC TC35/WG8** about safety on primary lithium cells.

In the test condition, the reason for setting the time for the external short-circuit to be 6 hours is that the cell is thought to be fully discharged its total capacity within an hour after being short-circuited, and the cell temperature becomes maximum within an hour, and it was judged that it is enough to confirm the decrease of the cell temperature after that without any aberrance.

2. Compulsory Discharging :

When the cell is compulsory discharged by external, or the cell is reverse-discharged (note: this portion should have been corrected as reverse-charged in accordance with the table of errata attached to this guideline) by connecting the terminals + – in a reverse condition erroneously, an estimated risk is the increase of internal pressure and the rise in temperature by the aberrant chemical reaction within the cell. Accordingly, there is a possibility of burst or firing of the cell in extreme cases.

This test is assumed a case where the cell is reverse-charged by erroneously being reverse-connected to a charger, by variations on cell capacity when a plurality of cells is used in a series-connected state, or the cells of degraded capacity are compulsory discharged by using new and old cells together.

The reason why the 250 % discharge of the rated capacity with the current

recommended by a manufacturer is set was adopted to the condition (UL1642) of a compulsory discharge test in UL, and it is expected that the cell becomes a commutating state unless the cell has a large amount of excess capacity relative to the rated capacity.

The reason for the conditional clause is as follows. When the cell has a safety apparatus, and a protection apparatus in inside, these safety apparatus and protection apparatus operate, it becomes impossible to flow further current, and accordingly a continuation of the test becomes meaningless.

3. Continuous Charging :

When the cell is charged more than allowable by continuously charging the cell, an estimated risk is the increase of internal pressure by the dissolution of the electrolytic solution due to the overcharging of the cell.

The test is assumed a case where the cell was left derelict while being connected to a normal charger.

The reason why one month by the charging method recommended by a manufacturer is set as the test method is that it is thought that a normal charger only flows minute current through the cell after supplying a predetermined amount of charging electric charge, or cuts off the current, and it is enough to guarantee a continuous charging for one month.

4. Overcharging : When the cell is overcharged by applying more than allowable voltage upon charging, an estimated risk is the increase of internal pressure and the rise in temperature by the aberrant chemical reaction within the cell. As the result, there is a possibility of the burst and the fire of the cell when the rise in temperature is large.

This test is assumed a case where the charger is broken or particularly the voltage control circuit is broken.

The reason why the current is set to the value recommended by a manufacturer is that the current control by the charger is assumed to be normal. Further, the reason why the charging amount is set to 250 % of the rated capacity is that it is thought that this largely exceeds allowable limit of the cell and it is enough to confirm the safety by over-charging.

The reason for the conditional clause is as follows. When the cell has a safety apparatus, and a protection apparatus in inside, these safety apparatus and protection apparatus operate, it becomes impossible to flow further current, and

accordingly a continuation of the test becomes meaningless.

5. Large-current Charging :

When the cell is charged with large current, an estimated risk is the rise in temperature by Joule heat. As the result, there is a possibility of the burst and the fire of cell when the rise in temperature is large.

This test is assumed a case where the charger is broken or particularly the current control is broken.

The reason why the current is set to three times the allowable value recommended by a manufacturer is that it is judged even if the current control circuit ids broken, the current more than this cannot flow in consideration of the internal impedance of the cell and the power of the charger.

Further, the reason why the charging amount is set to 100 % is that the object of the test is to check the effect of the current amount, and the overcharging is taken up at another item (Item No. 4).

The reason for the conditional clause is as follows. When the cell has a safety apparatus, and a protection apparatus in inside, these safety apparatus and protection apparatus operate, it becomes impossible to flow further current, and accordingly a continuation of the test becomes meaningless.